

What Is Claimed:

1. A tissue product comprising:
a tissue web containing pulp fibers, the tissue web having a first side and a second side;
a bonding material applied to the first side of the tissue web in a pattern, the pattern comprising a plurality of individual cells, each cell comprising first and second expanded regions connected together by a constricted region; and
wherein the first side of the tissue web has been creped after application of the bonding material, and wherein the tissue web has a negative Poisson ratio.
- 5 2. A tissue product as defined in claim 1, wherein the individual cells have a total length and a total width, the total length having a distance that is at least twice the distance of the total width.
3. A tissue product as defined in claim 1, further comprising a second bonding material applied to the second side of the tissue web in a pattern, the pattern also comprising a plurality of individual cells, each cell comprising first and second expanded regions connected together by a constricted region.
4. A tissue product as defined in claim 3, wherein the second side of the tissue web has been creped after application of the second bonding material.
5. A tissue product as defined in claim 1, wherein the bonding material comprises an ethylene vinyl acetate copolymer.
6. A tissue product as defined in claim 1, wherein the expanded regions of the individual cells have a square, triangular, hexagonal, curvilinear, or elliptical shape.
7. A tissue product as defined in claim 1, wherein the constricted regions of the individual cells have a width that is less than the length of the average length of the pulp fibers contained in the tissue sheet.
8. A tissue product as defined in claim 1, wherein the constricted regions of the individual cells have a width that is less than about 2 mm.
9. A tissue product as defined in claim 1, wherein the constricted regions of the individual cells have a width that is less than about 1 mm.
10. A tissue product as defined in claim 1, wherein the individual cells of the pattern are interconnected along at least two sides of each cell.

11. A tissue product as defined in claim 1, wherein the individual cells of the pattern are interconnected along all sides of each cell.

12. A tissue product as defined in claim 1, wherein the pulp fibers comprise softwood fibers.

13. A tissue product as defined in claim 1, wherein the tissue web comprises an uncreped through-air dried web prior to application of the bonding material.

14. A tissue product as defined in claim 1, wherein the pattern by which the bonding material has been applied to the first side of the tissue web covers from about 30% to about 80 % of the surface area of the web.

15. A tissue product as defined in claim 1, wherein the bonding material is applied to the first side of the tissue web in an amount from about 4% to about 10% by weight of the web.

16. A tissue product as defined in claim 1, wherein the tissue product has a bulk greater than about 5 cc/g.

17. A tissue product as defined in claim 1, wherein the tissue product has a bulk greater than about 9 cc/g.

18. A tissue product as defined in claim 1, wherein the bonding material is applied to the tissue web in a pattern that extends in the machine direction of the web and wherein when the tissue web is stretched in the machine direction, the constricted regions of the individual cells expand.

19. A tissue product as defined in claim 4, wherein the expanded regions of the individual cells have a square, triangular, hexagonal, curvilinear, or elliptical shape.

20. A tissue product as defined in claim 4, wherein the constricted regions of the individual cells have a width that is less than about 1 mm.

21. A tissue product as defined in claim 4, wherein the individual cells of the pattern are interconnected along all sides of each cell.

22. A tissue product as defined in claim 4, wherein the pattern applied to the first side of the tissue web and the pattern applied to the second side of the tissue web are substantially identical.

23. A tissue product as defined in claim 1, wherein the constricted regions of the individual cells have a width of from about 0.3 mm to about 1 mm.

24. A tissue product as defined in claim 1, wherein the constricted regions of the individual cells have a width of from about 0.5 mm to about 0.8 mm.

25. A tissue product as defined in claim 1, wherein the tissue web comprises a wet-creped web.

26. A tissue product as defined in claim 4, wherein the tissue web comprises a wet-creped web.

27. A tissue product comprising:

a tissue web containing pulp fibers, the pulp fibers comprising softwood fibers, the tissue web having a first side and a second side;

5 a first bonding material applied to the first side of the tissue web in a first pattern, the first pattern comprising a plurality of individual cells, each cell comprising first and second expanded regions connected together by a constricted region having a width of less than about 1 mm, the pattern being interconnected such that at least two sides of each individual cell are interconnected to adjacent cells;

10 a second bonding material applied to the second side of the tissue web in a second pattern, the second pattern also comprising a plurality of individual cells, each cell comprising first and second expanded regions connected together by a constricted region having a width of less than about 1 mm, the second pattern being interconnected such that at least two sides of each individual
15 cell are interconnected to adjacent cells;

wherein both sides of the tissue web have been creped after application of the bonding material; and

wherein the tissue product has a basis weight of from about 10 gsm to about 80 gsm, the tissue product having a Poisson ratio of less than about 0.3.

28. A tissue product as defined in claim 27, wherein the pattern extends in the machine direction and wherein the tissue web has a Poisson ratio of less than about 0.25.

29. A tissue product as defined in claim 27, wherein the pattern extends in the machine direction and wherein the tissue web has a Poisson ratio of less than about 0.1.

30. A tissue product as defined in claim 27, wherein the pattern extends in the machine direction and wherein the tissue web has a negative Poisson ratio.

31. A tissue product as defined in claim 27, wherein the tissue web comprises a wet-creped web.

32. A tissue product as defined in claim 27, wherein the expanded regions of the individual cells have a square, triangular, hexagonal, curvilinear, or elliptical shape.

33. A tissue product as defined in claim 27, wherein the individual cells of the pattern are interconnected along all sides of each cell.

34. A tissue product as defined in claim 27, wherein the tissue web comprises an uncreped through-air dried web prior to application of the bonding material.

35. A tissue product as defined in claim 27, wherein the first and second patterns cover from about 30% to about 80% of the surface area of each side of the tissue web.

36. A tissue product as defined in claim 27, wherein the bonding material is applied to the tissue web in a pattern that extends in the machine direction of the web and wherein when the tissue web is stretched in the machine direction, the constricted regions of the individual cells expand.

37. A method for producing a tissue product comprising:
providing a tissue web comprising pulp fibers, the tissue web having a first side and second side;
applying a first bonding material to the first side of the web in a
5 preselected pattern, the pattern comprising a plurality of individual cells, each cell comprising first and second expanded regions connected together by a constricted region;
adhering the first side of the web to a creping surface; and
creping the first side of the web from the creping surface.

38. A method as defined in claim 37, wherein a second bonding material is applied to the second side of the web in a second preselected pattern, the second pattern also comprising a plurality of individual cells, each cell comprising first and second expanded regions connected together by a constricted region.

39. A method as defined in claim 37, wherein the resulting tissue product has a Poisson ratio of less than about 0.3.

40. A method as defined in claim 37, wherein the resulting tissue product has a Poisson ratio of less than about 0.1.

41. A method as defined in claim 37, wherein the expanded regions of the individual cells have a square, triangular, hexagonal, curvilinear, or elliptical shape.

42. A method as defined in claim 37, wherein the constricted regions have a width of less than about 1 mm.

43. A method as defined in claim 37, wherein the constricted regions have a width of from about 0.3 mm to about 0.8 mm.

44. A method as defined in claim 37, wherein the individual cells contained in the pattern are interconnected.

45. A method as defined in claim 37, wherein the tissue product has a basis weight of from about 20 gsm to about 80 gsm and has a bulk of greater than about 9 cc/g, the bonding material being applied to the first side of the web in an amount of from about 4% to about 10% by weight of the web.

46. A method as defined in claim 37, wherein the tissue web has a length and a width and wherein the width shrinks less than 1.5% during creping.

47. A web having a reduced Poisson ratio comprising:
a nonwoven web comprising fibers, the nonwoven web having a first side and a second side; and

5 a pattern formed into the nonwoven web, the pattern comprising a plurality of interconnected individual cells, each cell comprising first and second expanded regions connected together by a constricted region.

48. A web as defined in claim 47, wherein the nonwoven web comprises a meltspun web and wherein the pattern is thermally bonded into the web.

49. A web as defined in claim 47, wherein the nonwoven web comprises a tissue web containing pulp fibers, the pattern being formed into the nonwoven web by applying a bonding material to at least one side of the web.

50. A web as defined in claim 47, wherein the nonwoven web comprises a tissue web, and wherein the tissue web is formed on a forming fabric having a 3-dimensional topography, the pattern being contained in the 3-dimensional topography and being incorporated into the tissue web during formation.

51. A web as defined in claim 49, wherein the tissue web has been creped after application of the bonding material.

52. A web as defined in claim 47, wherein the nonwoven web comprises a hydroentangled web.

53. A web as defined in claim 47, wherein the nonwoven web comprises an elastic web containing an elastomeric material.

54. A laminated web comprising a patterned layer of material, wherein the patterned layer is arranged in a pattern comprising a plurality of individual cells, each cell comprising first and second expanded regions connected together by a constricted region.

55. A laminated web as defined in claim 54, wherein the patterned layer is chosen from a scrim or a film.

56. A laminated web as defined in claim 55, further comprising a tissue web containing pulp fibers, wherein the tissue web is laminated to the patterned layer.

57. A laminated web as defined in claim 55, further comprising a meltspun web, wherein the meltspun web is laminated to the patterned layer.